Chapter 3 Review Extra Practice

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1. Draw the graph of a polynomial function that has all of the following characteristics:
$f(1) = 8, f(-1) = 0, f(5) = 0$
The y-intercept is 10.
$f(x) > 0$ when $-1 < x < 2$
$f(x) < 0$ when $x < -1$
The domain is the set of real numbers.

2. Describe the end behaviour of each polynomial function using the degree and the leading coefficient.
a) $f(x) = x^3 - 4x^2 + 5x - 2$
b) $f(x) = -2x^3 + 3x + 1$
c) $f(x) = 5x^4 - 2x^2 + 1$
d) $f(x) = -x^4 + 3x^3 - 2x^2 + x + 7$

3. For each of the following, write the equations of three quartic functions that have the given zeros and belong to the same family of functions.
a) 2, 1, −4, −1
b) 5, 6, −2, 3
c) −2, −3, 4, 1
d) 8, −6, −4, −3

4. Sketch the graph of $f(x) = (x - 1)(x + 5)(x + 6)$ using the zeros and end behaviours.

5. Describe the transformations that were applied to $y = x^2$ to obtain each of the following functions.
a) $y = 3(x + 2)^2 - 8$
b) $y = -\left(\frac{4}{3}(x - 4)\right)^2 + 6$
c) $y = 5(2(x - 7))^2 - 9$
d) $y = -\frac{1}{4}(x + 5)^2 + 12$

6. Calculate each of the following using long division.
a) $(3x^3 - 4x + 5) \div (x - 2)$
b) $(x^4 - 5x^3 + 6x^2 - 4x + 8) \div (x^2 - 4)$
c) $(5x^4 - 6x^3 - x^2 + 4x + 7) \div (x^3 + 3x^2 - 4x + 9)$
d) $(x^5 - 7x^4 + 3x^3 - 2x^2 - 4x + 8) \div (x^4 + 5x^3 - 4x^2 - 8x + 1)$

7. Divide each polynomial by $x - 3$ using synthetic division.
a) $3x^3 - 2x^2 + 4x - 6$
b) $4x^3 + 5x^2 - 2x - 4$
c) $6x^4 - 4x^3 - x^2 + 5x + 8$
d) $5x^4 - 4x^2 + 3x - 9$

8. Factor each polynomial using the factor theorem.
a) $x^3 + 2x^2 - 5x - 6$
b) $2x^3 + 3x^2 - 59x - 30$
c) $4x^4 - 23x^3 + 38x^2 - 13x - 6$
d) $x^4 + 8x^3 + 11x^2 - 8x - 12$

9. Factor fully.
a) $x^3 + 9x^2 + 15x - 25$
b) $x^3 + 2x^2 - 16x - 32$
c) $4x^4 + 11x^3 - 30x^2 - 99x - 54$
d) $2x^4 + 7x^3 - 5x^2 - 28x - 12$

10. Factor each difference of cubes.
a) $125x^3 - 64$
b) $1000x^3 - 27$
c) $729x^3 - 8$
d) $27x^3 - 1$

11. Factor each sum of cubes.
a) $2744x^3 + 729$
b) $1331x^3 + 343$
c) $1728x^3 + 216$
d) $3375x^3 + 512$